M2500 Engine Controller
Installation Manual

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1 Introduction

The M2500 is designed for control and monitoring of marine engines.

Together with the optional Shut Down Unit the M2500 can form a complete alarm, control and protective safety system for marine engines.

Typical applications are marine generator engines such as auxiliary generators, emergency generators and harbour generators.

The unit is designed for assembly in the main switchboard or directly at the engine.

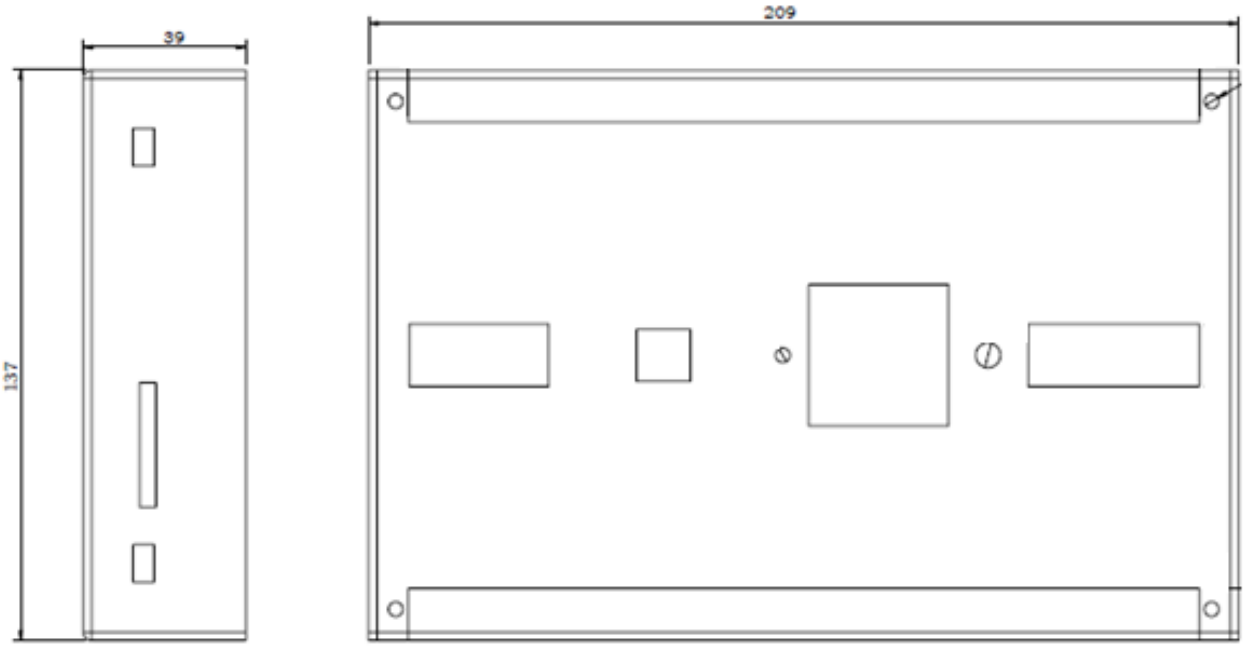
This manual describes the in and output terminals of the M2500 and how to connect them.

For the functionality and configuration please refer to the Configuration Manual.

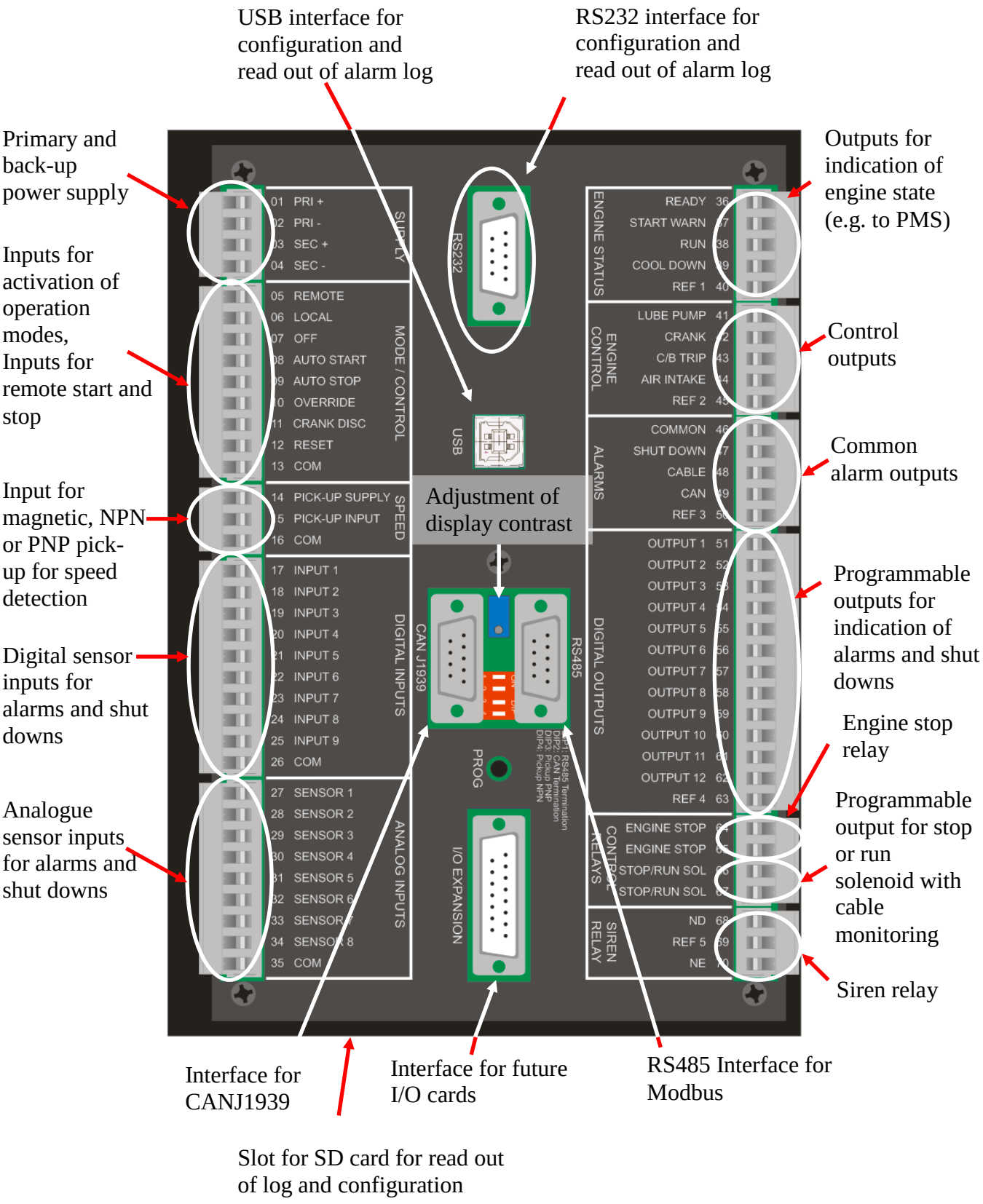
2 Installation

The unit is designed for flush mounting to the front panel of the switchboard. It is secured by 4 mounting brackets which are supplied with the unit.

The cut out dimension is 138mm x 210mm



3 Terminal Connections


USB interface for configuration and read out of alarm log
RS232 interface for configuration and read out of alarm log
Primary and back-up power supply
Inputs for activation of operation modes, Inputs for remote start and stop
Input for magnetic, NPN or PNP pick-up for speed detection
Digital sensor inputs for alarms and shut downs
Analogue sensor inputs for alarms and shut downs
Outputs for indication of engine state (e.g. to PMS)
Control outputs
Common alarm outputs
Programmable outputs for indication of alarms and shut downs
Engine stop relay
Programmable output for stop or run solenoid with cable monitoring
Siren relay
Adjustment of display contrast
Interface for CANJ1939
Interface for future I/O cards
RS485 Interface for Modbus
Slot for SD card for read out of log and configuration
SUPPLY
MODE / CONTROL
SPEED
DIGITAL INPUTS
ANALOG INPUTS
ENGINE STATUS
ENGINE CONTROL
ALARMS
DIGITAL OUTPUTS
CONTROL RELAYS
SIREN RELAY
RS232
USB
CAN J1939
RS485
PROG
I/O EXPANSION

4 Inputs

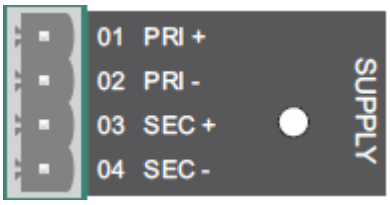
4.1 Power Supply

Redundant Power Supply (2x 24V DC, -30 % / +30 %)

Alarm in case any power supply fails (common alarm + display text).

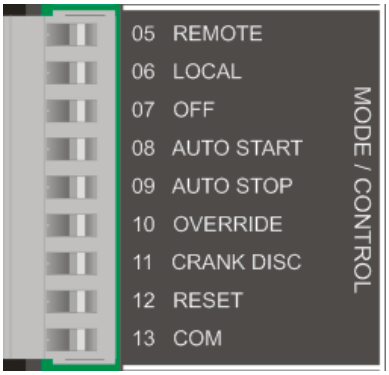
Primary supply will not be monitored during cranking, as the battery voltage will drop during this process.

Nr.	Description
01	Primary Supply +
02	Primary Supply -
03	Primary Supply +
04	Primary Supply -



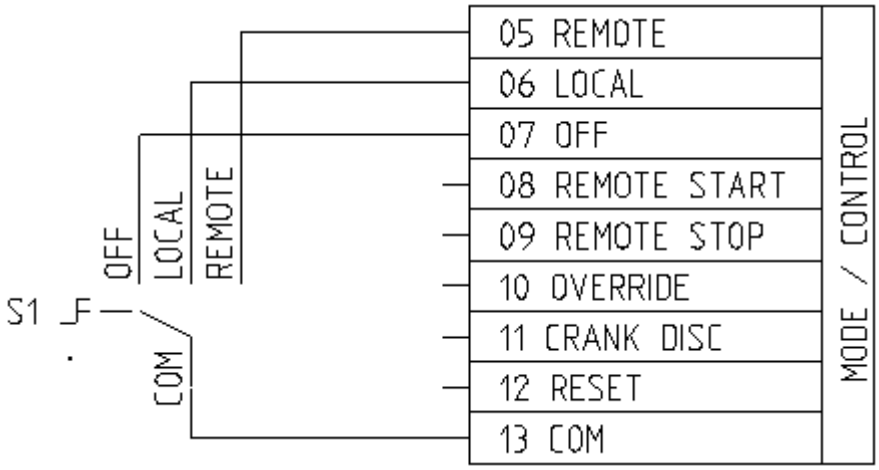
4.2 Mode/ Control Inputs

Nr.	Description	Logic (NO/NC)
05	Remote Mode	NO
06	Local Mode	NO
07	Off Mode	NO
08	Remote Start	NO
09	Remote Stop	NO
10	Override	NO
11	Crank disconnect	NO
12	RESET	NO
13	COM	Common reference for control inputs



4.2.1 Connection of Mode Selector Switch

The external mode selector switch is used for switching the M2500 into OFF, REMOTE or LOCAL mode.



4.2.1.1 Local Mode (terminal 5)

This input is considered active when connected to COM, inactive when open.

When active the M2500 will be in local mode. This means start and stop are only available from the push buttons on the front panel. The remote start and stop terminals are disabled. The LOCAL LED on the front panel will be lit. Not ready LED on the front panel will be lit and READY output terminal 36 will be deactivated for indication that the engine is not available for remote start.

4.2.1.2 Remote Mode (terminal 6)

This input is considered active when connected to COM, inactive when open.

When active the M2500 will be in remote mode. This means start and stop are only available from the REMOTE START and REMOTE STOP terminals. The Local start and stop push buttons are disabled.

Provided no alarm, shutdown or Off command is active, the green REMOTE LED on the front panel will be lit and the engine is ready for remote start.

4.2.1.3 Off (terminal 7)

This input is considered active when connected to COM, inactive when open.

When activated, the M2500 will generate a stop procedure. The engine will be blocked for start as long as this input is active.

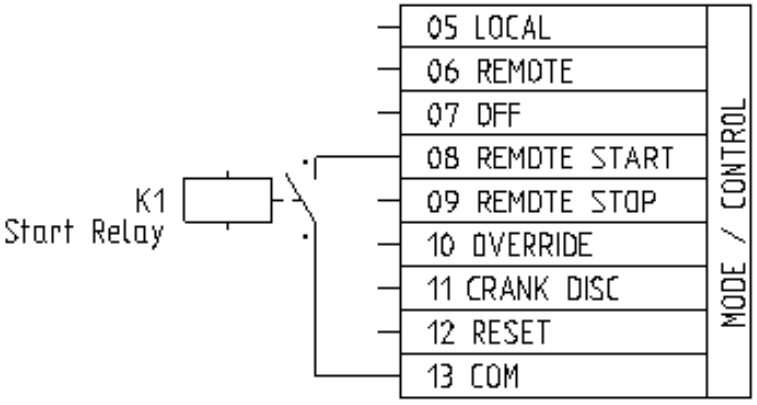
Not ready LED on the front panel will be lit for indication that the engine is not available for remote start.

4.2.2 Remote Start (terminal 8)

This input is considered active when connected to COM, inactive when open. It can be a pulse or continuous signal.

The input is only enabled in remote mode.

When activated, the unit will generate a start signal to the engine. The pre-configured amount of start attempts is available. During the start attempt the green Engine Running LED on the front panel will be fast flashing. During the rest periods between two start attempts this LED will be slow flashing. When the engine is running, the LED will be lit continuously.



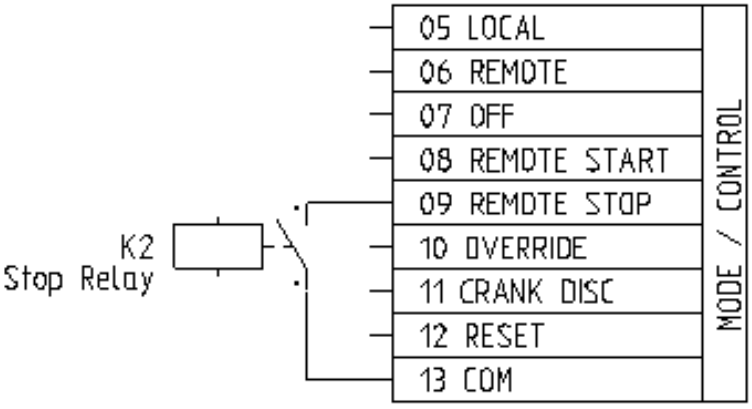
In case the engine does not start the unit will generate a stop procedure and a Start Fail Alarm. The red ALARM LED on the front panel will be lit. The alarm text “START FAILURE” will be shown on the display.

4.2.3 Remote Stop (terminal 9)

This input is considered active when connected to COM, inactive when open. It can be a pulse or continuous signal.

The input is only enabled in remote mode.

When activated, the unit will generate a stop procedure. During the stop procedure the green Running LED will be slow flashing. The Stopping LED will be lit. In case the engine does not stop the unit will generate a Stop Fail Alarm. The red ALARM LED on the front panel will be lit. The alarm text “STOP FAILURE” will be shown on the display.

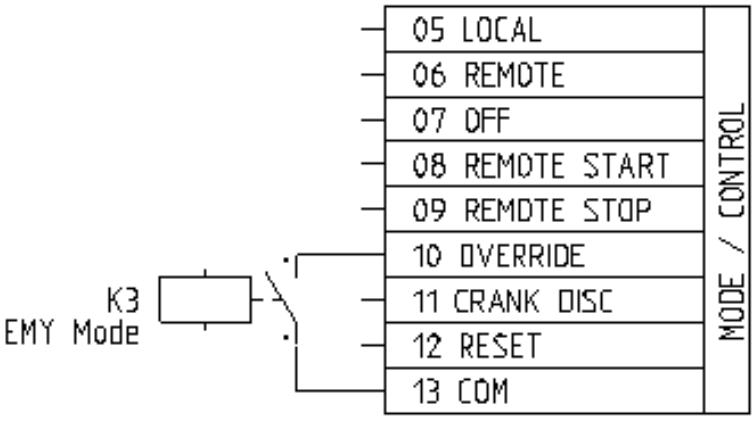


The engine will be blocked for start as long as the stop input is active. When activated simultaneously, Stop overrides Start.

4.2.4 Override (terminal 10)

This input is considered active when connected to COM, inactive when open.

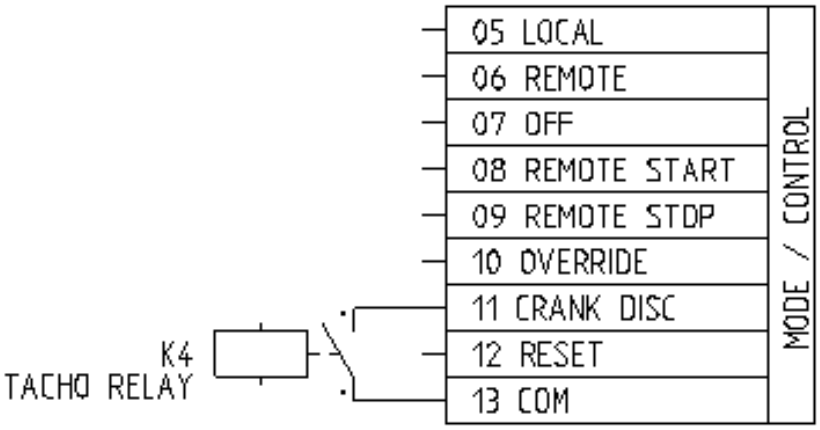
When activated all shut downs that are marked override will be disabled. This means the engine will continue running despite of a shut down. In case override is deactivated while a shutdown is present, the shut down will be executed immediately.



4.2.5 Crank disconnect (terminal 11)

This input is considered active when connected to COM, inactive when open.

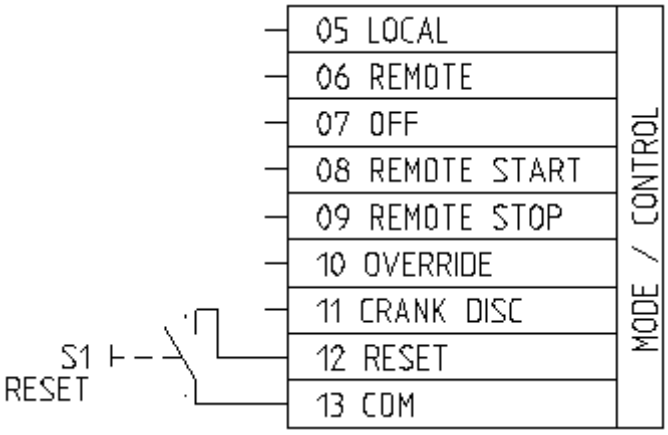
This input is only used in case there is no pick-up for speed detection. The input is a contact from a tacho-relay that signals that the speed of the engine is above ignition speed. Upon receipt of this signal the unit will deactivate the crank output after a start attempt. In case the unit looses this signal without a stop procedure, the ALARM LED will be lit and a Tacho Fail Alarm will be displayed.



4.2.6 Reset (terminal 12)

This input is considered active when connected to COM, inactive when open.

When activated, this input will reset the siren and the alarm/ shut down.



4.2.7 COM (terminal 13)

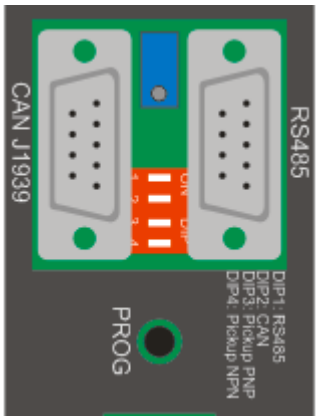
This is the common reference for all digital inputs. This terminal is the same as the minus of the power supply that is currently used for supply of the unit.

4.3 Speed detection

Speed detection		Remark
14	Pick-up	Supply voltage for PNP or NPN pick-up
15		Pick-Up signal input
16		Reference for pick-up signal

4.3.1 Connection of magnetic pick-up

The magnetic pick-up is connected as follows:

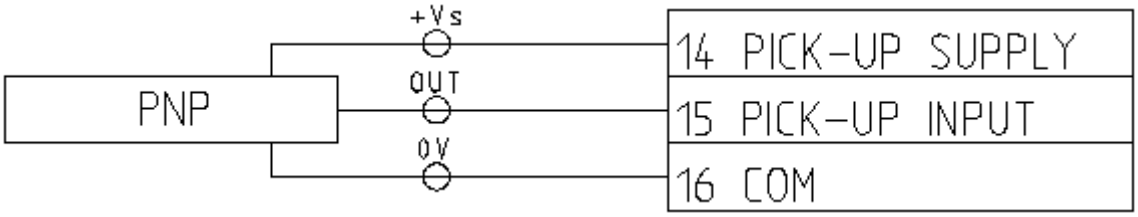


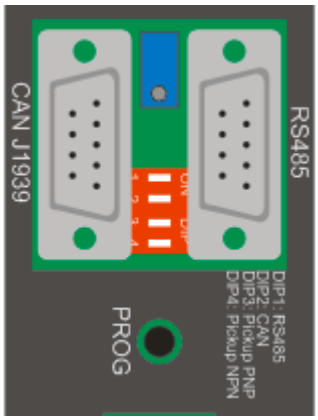
For use of magnetic pick-up the DIP switches 3 and 4 on the rear side of M2500 must be in OFF position

DIP Switch	Position
3	OFF
4	OFF

4.3.2 Connection of PNP pick-up

The NPN pick-up is connected as follows:



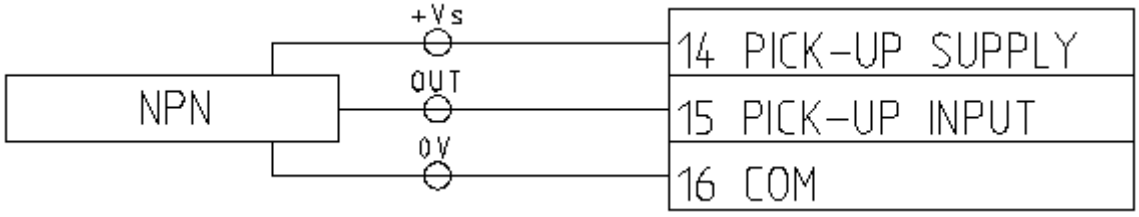


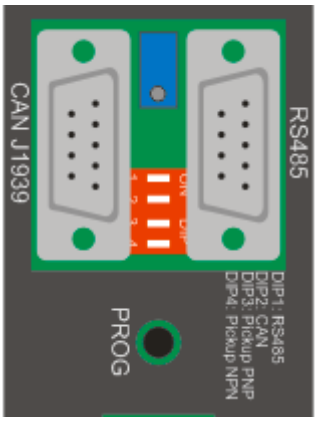
For use of PNP pick-up the DIP switch 3 on the rear side of M2500 must be in ON position, DIP switch 4 must be in OFF position.

DIP Switch	Position
3	ON
4	OFF

4.3.3 Connection of NPN pick-up

The NPN pick-up is connected as follows:



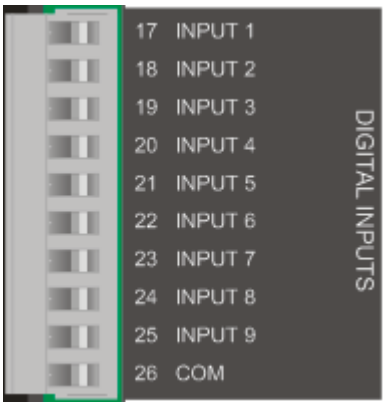


For use of NPN pick-up the DIP switch 3 on the rear side of M2500 must be in OFF position, DIP switch 4 must be in ON position.

DIP Switch	Position
3	OFF
4	ON

4.4 Digital sensor inputs

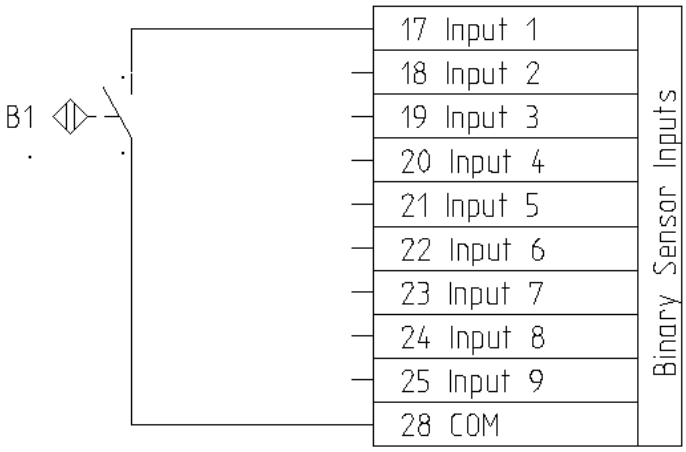
Nr.	Description	Remark
17	Digital input 1	Sensor input for digital sensor 1
18	Digital input 2	Sensor input for digital sensor 2
19	Digital input 3	Sensor input for digital sensor 3
20	Digital input 4	Sensor input for digital sensor 4
21	Digital input 5	Sensor input for digital sensor 5
22	Digital input 6	Sensor input for digital sensor 6
23	Digital input 7	Sensor input for digital sensor 7
24	Digital input 8	Sensor input for digital sensor 8
25	Digital input 9	Sensor input for digital sensor 9
26	COM	Common reference for digital sensor inputs



These inputs are used for the connection of the digital sensors. The sensors can be Normally Open (NO) or Normally Closed (NC) logic. Cable break and short circuit monitoring is possible.

4.4.1 Connection of a normally open sensor without cable monitoring

This example shows the Connection of a normally open sensor without cable monitoring.

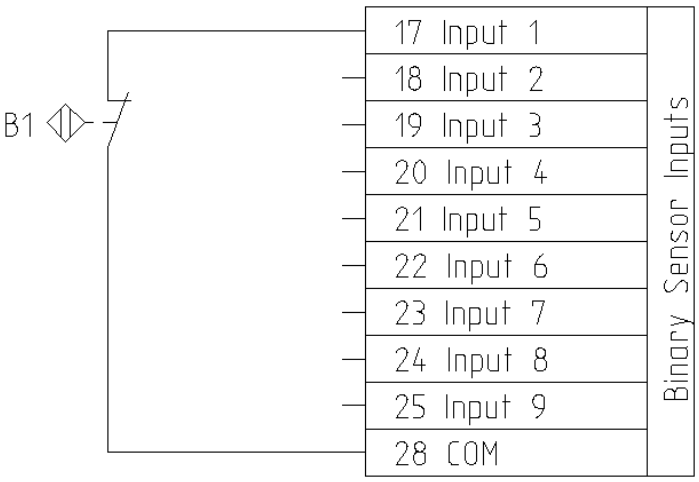


The sensor is considered active when connected to COM, inactive when open.

When activated, the input generates an alarm or shut downs or a control signal, depending on the configuration.

4.4.2 Connection of a normally closed sensor without cable monitoring

This example shows the Connection of a normally closed sensor without cable monitoring.

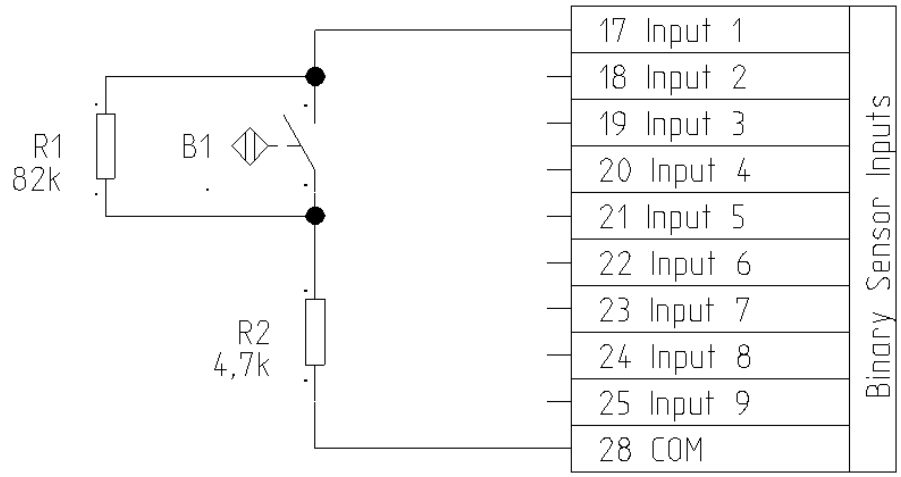


The sensor is considered active when open, inactive when connected to COM.

When activated, the input generates an alarm or shut downs or a control signal, depending on the configuration.

4.4.3 Connection of a normally open sensor with cable monitoring

This example shows the Connection of a normally open sensor with cable monitoring.



The sensor is considered active when connected to COM, inactive when open.

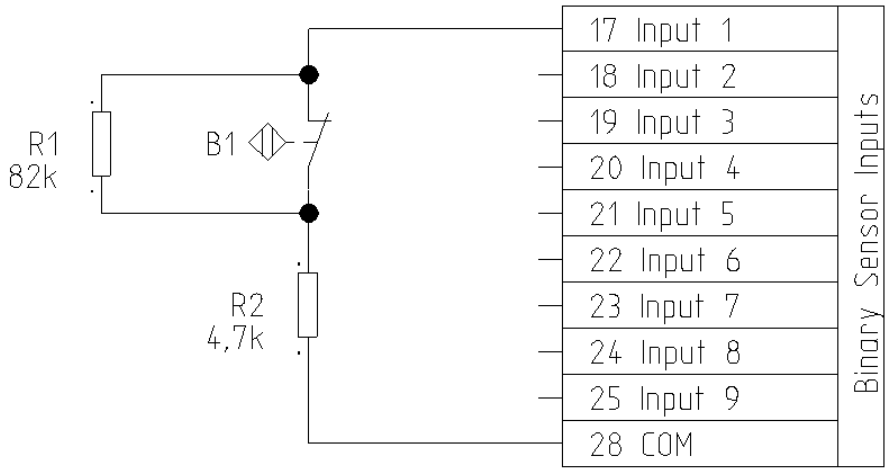
Resistor R1 is used for cable break monitoring.

Resistor R2 is used for short circuit monitoring.

It is very important that both resistors are mounted close to the sensor.

4.4.4 Connection of a normally closed sensor with cable monitoring

This example shows the connection of a normally closed sensor with cable monitoring.



The sensor is considered active when open, inactive when connected to COM.

Resistor R1 is used for short circuit monitoring.

Resistor R2 is used for cable break monitoring.

It is very important that both resistors are mounted close to the sensor.

4.4.5 COM (terminal 13)

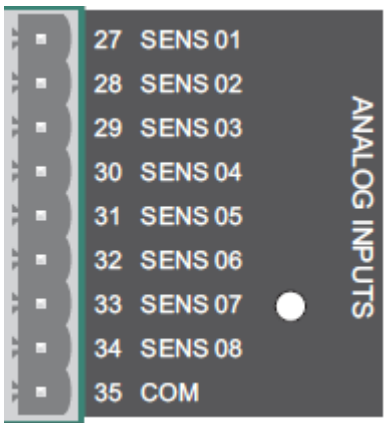
This is the common reference for all digital inputs. This terminal is the same as the minus of the power supply that is currently used for supply of the unit.

4.5 Analogue sensor inputs

Analogue sensor inputs are used for temperature and pressure measurements.

All analogue sensors use 4-20mA signals.

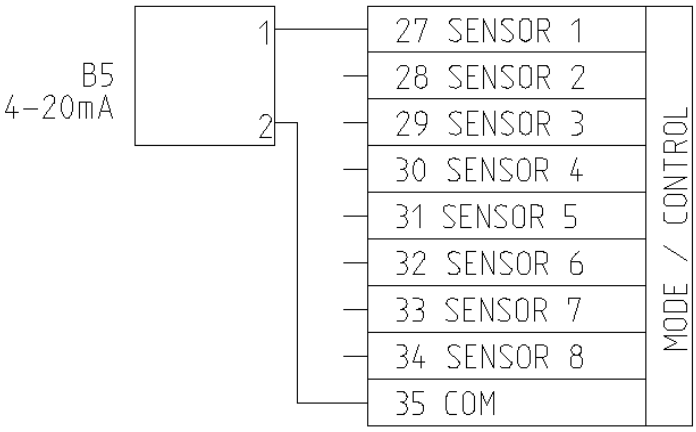
Analogue Sensor Inputs		Remark
27	4mA -20mA	Analogue input 1
28	4mA -20mA	Analogue input 2
29	4mA -20mA	Analogue input 3
30	4mA -20mA	Analogue input 4
31	4mA -20mA	Analogue input 5
32	4mA -20mA	Analogue input 6
33	4mA -20mA	Analogue input 7
34	4mA -20mA	Analogue input 8
35	COM	Common reference for analogue sensor inputs



4.5.1 Analogue inputs (terminals 27 to 34)

These are the analogue sensor inputs for generation of alarms and shut downs. In case the input signal is below 3mA or above 25mA the unit will generate a sensor fail alarm. Cable Error LED will be lit.

Delay times can be programmed for these alarms/ shut downs.



4.5.2 COM (terminal 13)

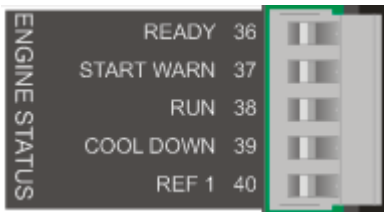
This is the common reference for all analogue inputs. This terminal is the same as the minus of the power supply that is currently used for supply of the unit.

5 Outputs

All outputs are relay contacts.

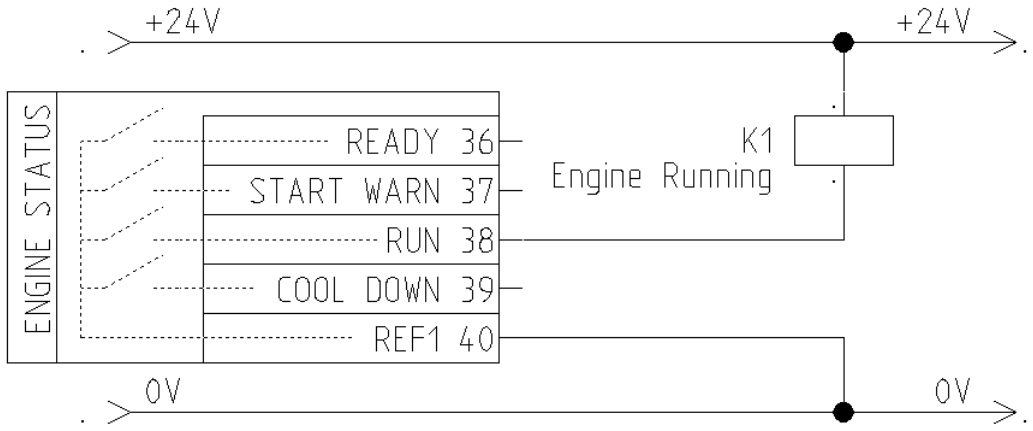
5.1 Engine Status Outputs

Nr.	Description	Type	Rating
36	Ready/ Not Ready	NO Relay	1A
37	Start warning	NO Relay	1A
38	Engine Running	NO Relay	1A
39	Cool down	NO Relay	1A
40	REF1	Common reference for engine status outputs	



5.1.1 Connection of Engine Status Outputs

Following example shows the connection of an external relay for the engine running signal:



5.1.2 Ready (terminal 36)

Normally Open Relay output. This output indicates the availability of the engine for remote start e.g. for a power management system. It can be configured as an "Engine Ready" or an "Engine Not Ready" output. The output is closed to COM (terminal) 40 when activated and open when deactivated.

Configuration as Ready Output:

This is the information to a power management system that the engine is available for power management.

The output is activated when the engine is available for remote start. The output is de-activated in all other conditions (e.g. M2500 in Local mode shut down error or start blocking) (normally de-energized output).

Configuration as Not Ready output:

This is the information to a power management system that the engine is not available for power management.

The output is activated when the engine is not available for remote start (e.g. M2500 in Local mode shut down error or start blocking).

The output is de-activated when the output is ready for remote start (normally energized output).

5.1.3 Start warning (terminal 37)

Normally Open Relay output. This output is activated for a preconfigured time before each start attempt. When activated the output is closed to COM (terminal) 40 and open when deactivated. The relay is normally de-energized.

5.1.4 Engine running (terminal 38)

Normally Open Relay output. This output indicates that the engine is running. When activated the output is closed to COM (terminal) 40 and open when deactivated. The relay is normally de-energized.

5.1.5 Cool Down (terminal 39)

Normally Open Relay output. This output indicates that the engine is in cool down mode. After receipt of engine stop command, the M2500 will trip the C/B. Now the engine will continue running for the duration of the cool down time. After expiration of the cool down time the M2500 will stop the engine. The cool down time can be configured. It only applies to remote mode and only for normal stops. Shut downs will be executed immediately.

Purpose of this output is to give a signal to a synchronizer in order to avoid re-synchronization.

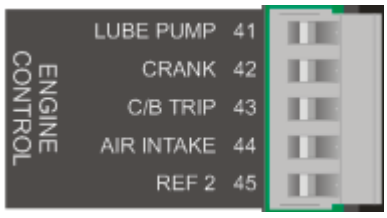
When activated the output is closed to COM (terminal) 40 and open when deactivated. The relay is normally de-energized.

5.1.6 REF 1 (terminal 40)

Common reference for all output relays terminals 36 to 39.

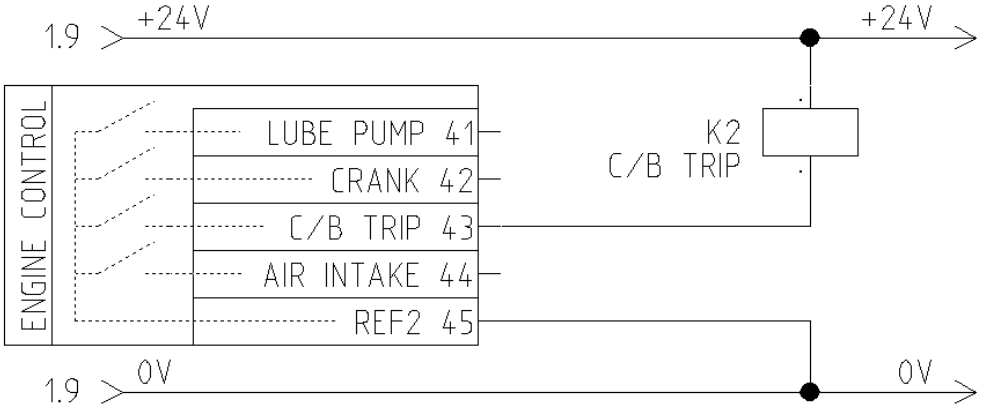
5.2 Engine Control Outputs

Nr.	Description	Type	Rating
41	Auxiliary lubrication pump	NO Relay	1A
42	Crank	NO Relay	1A
43	Circuit breaker trip	NO Relay	1A
44	Air intake valve	NO Relay	1A
45	REF 2	Common reference for the control outputs	



5.2.1 Connection of Engine Control Outputs

Following example shows the connection of an external relay for the C/B trip signal:



5.2.2 Auxiliary Lubrication Pump (terminal 41)

Normally Open Relay output. This output becomes active each 30 min for 2 min when the engine is stopped. Immediately after stop the first lubrication period is after 20min. The times can be configured.

The relay is normally de-energized.

5.2.3 Crank (terminal 42)

Normally Open Relay output. This is the start output of the M2500. It activates for each start attempt and remains active until either the engine has fired or the crank time has expired or a stop command has been activated at the M2500.

The relay is normally de-energized.

5.2.4 C/B trip (terminal 43)

Normally Open Relay output. This output trips the circuit breaker before the engine stops. It is always activated after a stop command has been received or a shut down has been activated.

The relay is normally de-energized.

5.2.5 Air Intake Valve (terminal 44)

Normally Open Relay output. This is an alternative stop output. The output is activated immediately when a stop procedure is activated, regardless if this is a normal stop or a shut down.

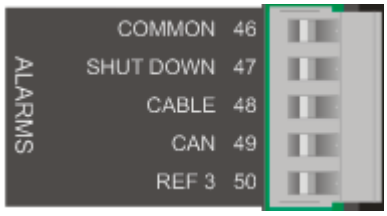
The relay is normally de-energized.

5.2.6 REF 2 (terminal 45)

Common reference for all output relays terminals 41 to 44.

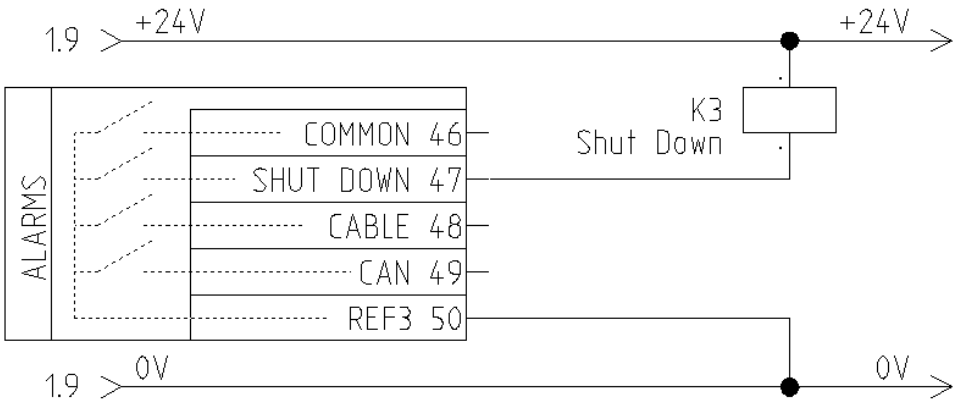
5.3 Alarm Outputs

Nr.	Description	Type	Rating
46	Common Alarm	NO Relay	1A
47	Shut Down	NO Relay	1A
48	Cable Break	NO Relay	1A
49	Communication Error	NO Relay	1A
50	REF 3	Common reference for the alarm outputs	



5.3.1 Connection of alarm outputs

Following example shows the connection of an external relay for signaling a shut down to an external alarm system:



5.3.2 Common Alarm (terminal 46)

Normally Open Relay output. This output becomes energized for each alarm and shut down.

The relay is normally de-energized. In case a new alarm/ shut down appear while the relay is already energized, the alarm will de-energize for two seconds and then energize again.

5.3.3 Shut Down (terminal 47)

Normally Open Relay output. This output becomes active for each shut down.

The relay is normally de-energized.

5.3.4 Cable break (terminal 48)

Normally Open Relay output. This output becomes active for each cable break at the digital inputs or sensor fails at the analogue inputs.

The relay is normally de-energized.

5.3.5 CAN (terminal 49)

Normally Open Relay output. This output becomes active in case a communication error on the CAN J1939 is detected.

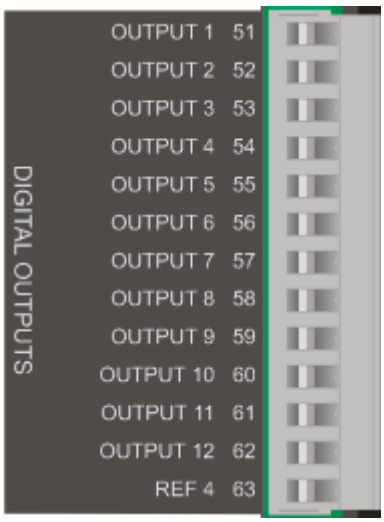
The relay is normally de-energized.

5.3.6 REF3 (terminal 50)

Common reference for all output relays terminals 46 to 49.

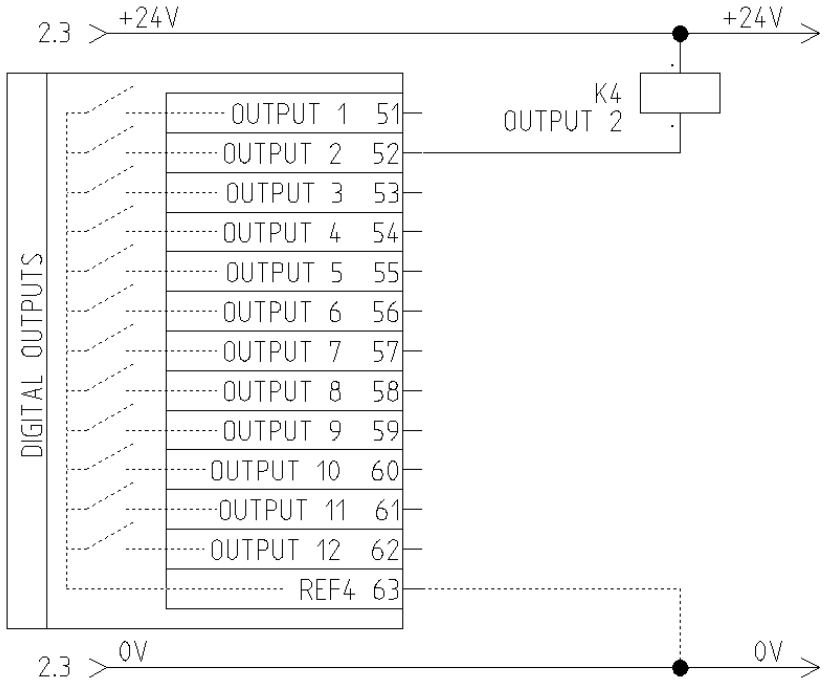
5.4 Digital Outputs

Nr.	Description	Type	Rating
51	Digital Output 1 (start fail in default config)	NO Relay	1A
52	Digital Output 2 (stop fail in default config)	NO Relay	1A
53	Digital Output 3	NO Relay	1A
54	Digital Output 4	NO Relay	1A
55	Digital Output 5	NO Relay	1A
56	Digital Output 6	NO Relay	1A
57	Digital Output 7	NO Relay	1A
58	Digital Output 8	NO Relay	1A
59	Digital Output 9	NO Relay	1A
60	Digital Output 10	NO Relay	1A
61	Digital Output 11	NO Relay	1A
62	Digital Output 12	NO Relay	1A
63	REF 4	Common reference for the digital outputs	



5.4.1 Connection of digital outputs

Following example shows the connection of an external relay to digital output 2:



5.4.2 Digital Outputs Out 1 to Out 12 (terminals 51 to 62)

Normally Open Relay output. These are programmable alarm and shut down outputs. It is also possible to program these outputs to activate with any of the alarms generated from the analogue measurements.

In factory default configuration Digital Output 1 (terminal 51) is the START FAILURE OUTPUT.

In factory default configuration Digital Output 2 (terminal 52) is the STOP FAILURE OUTPUT.

5.4.3 REF 4 (terminal 50)

Common reference for all output relays terminals 51 to 62.

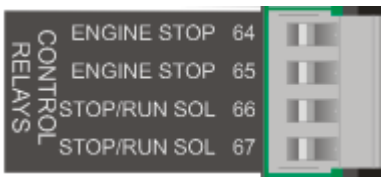
5.5 Control Relays

Nr.	Description	Type	Rating	Remark
1	Engine Stop	Energized to stop	1A	
2	Engine Stop			
3	Run/ Stop Solenoid	Energized to run or energized to stop	24V DC / 6A	Cable monitoring
4	Run/ Stop Solenoid			

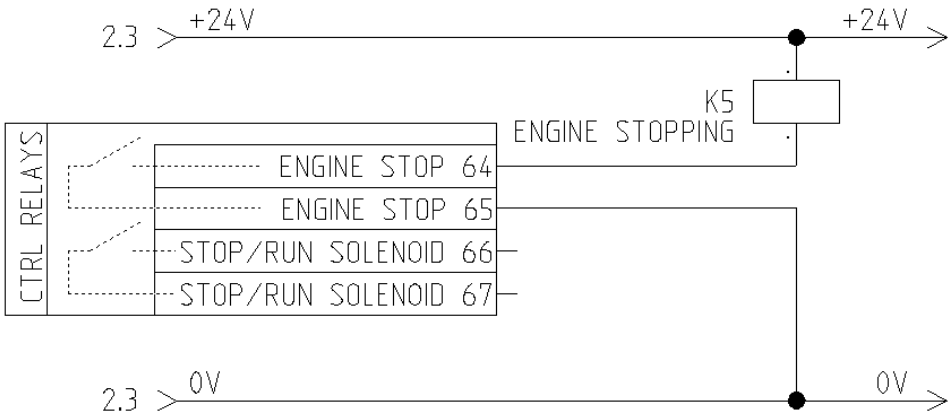
Cable break monitoring is required for the stop solenoid output. The nominal voltage for this output is 24V DC, 6A current when activated.

5.5.1 Engine Stop Output (terminal 64 and 65)

Terminals 64 and 65 are a normally open contact. This output will be activated for the stop procedure until the stop time has expired (energized to stop). The output is activated both for normal stops and shut downs. It is active in parallel with the stop solenoid relay. Purpose of this output is to give a voltage free signal to the shut down unit that the engine is stopping.



The relay is normally de-energized



5.5.2 Run/ Stop Solenoid (terminal 66 and 67)

This output can be configured for control of the fuel valve (run solenoid) or stop solenoid.

Output configured for control of stop solenoid

In this case terminals 66 and 67 are the output for control of the stop solenoid. This output will be activated for the stop procedure until the stop time has expired (energized to stop) or (in case a pick up is used for speed detection) until the engine speed is down to 10rpm (value depending on what is practical), both for normal stops and shut downs.

The relay is normally de-energized. This output includes cable monitoring for the stop solenoid.

Please note that this output can only be used with 24V DC

This can be either the same supply as for the controller or a separate power supply.

Please observe correct polarity when connecting the fuel valve.

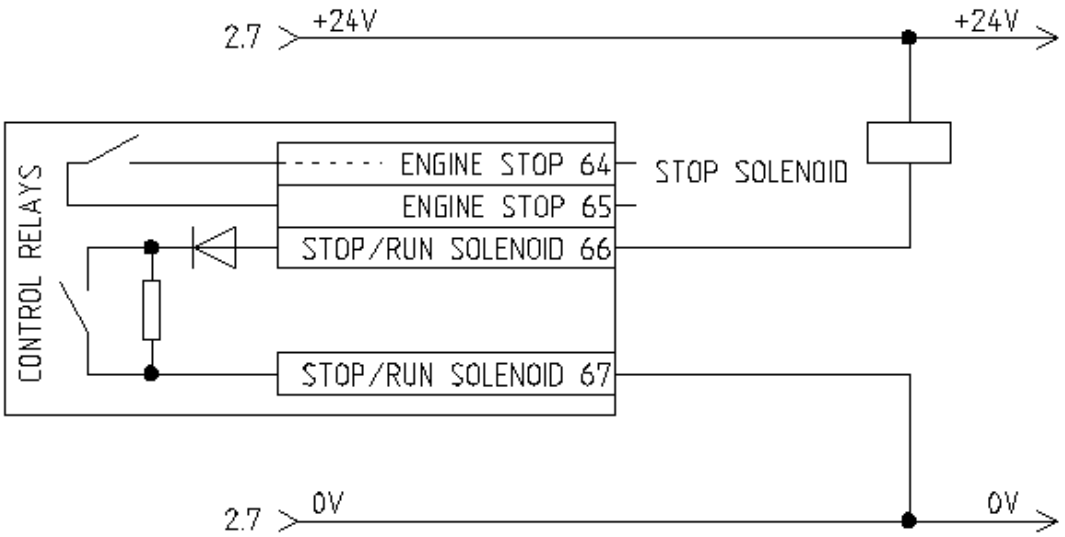
When deactivated there will be a current of **5mA** on this output due to the cable monitoring circuit inside the unit.

The coil connected to this output must require a current > 5mA for activating. Otherwise the stop solenoid could be activated by the cable monitoring circuit.

This is especially important in case the stop solenoid is not activated directly by the M2500 output but by an intermediate relay, that typically requires a much lower current to activate than the stop solenoid.

The cable monitoring on this output can be disabled in the configuration, however even then the 5mA limit still applies.

In case the connection to the stop solenoid is lost and cable monitoring is enabled in the configuration an alarm will be activated.



Output configured for control of run solenoid (fuel valve)

In this case terminals 66 and 67 are a normally open contact for control of the fuel valve. This output will be activated during start and operation of the engine (energized to run). For engine stop the output will be de-activated. The relay is normally de-energized. This output includes cable monitoring for the run solenoid.

Please note that this output can only be used with 24V DC

This can be either the same supply as for the controller or a separate power supply.

Please observe correct polarity when connecting the fuel valve.

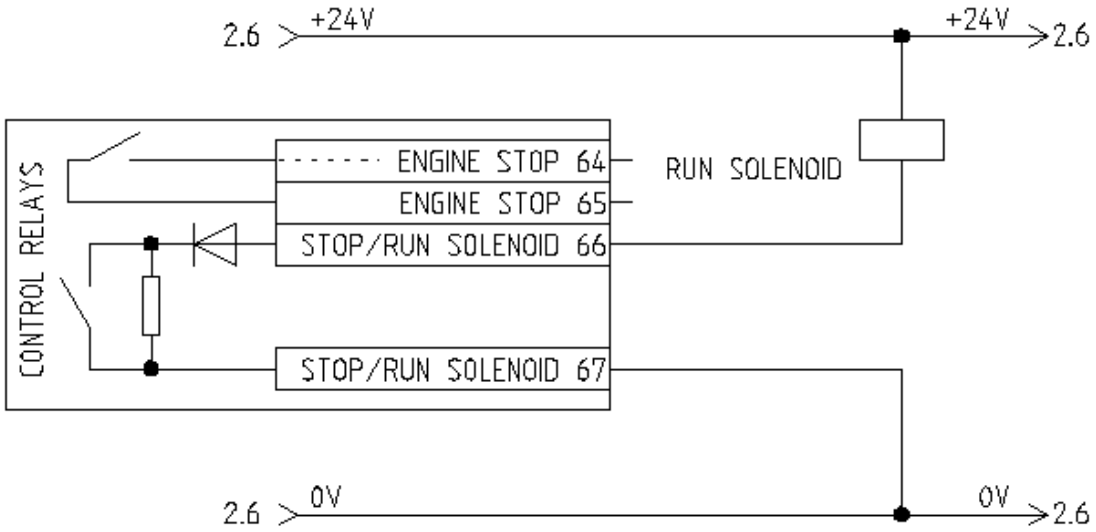
When deactivated there will be a current of **5mA** on this output due to the cable monitoring circuit inside the unit.

The coil connected to this output must require a current > 5mA for activating. Otherwise the fuel valve could be activated by the cable monitoring circuit.

This is especially important in case the fuel valve is not activated directly by the M2500 output but by an intermediate relay, that typically requires a much lower current to activate than the fuel valve.

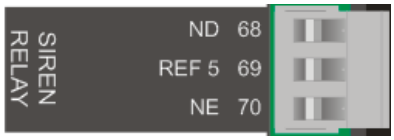
The cable monitoring on this output can be disabled in the configuration, however even then the 5mA limit still applies.

In case the connection to the fuel valve is lost and cable monitoring is enabled in the configuration an alarm will be activated.



5.6 Siren Relay

Nr.	Description	Type	Rating
68	ND	Relay contact in de-energized position	1A
69	REF 5	Reference contact of alarm relay	1A
70	NE	Relay contact in energized position	1A

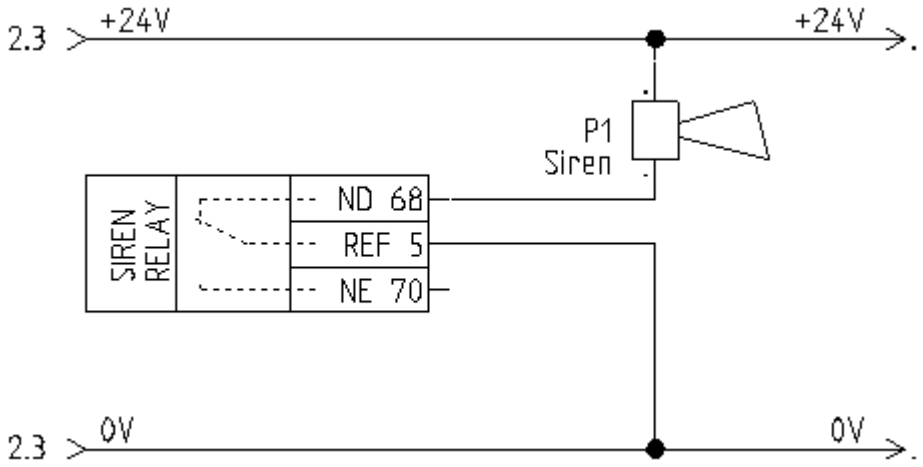


The siren relay is typically used for connection of a siren. It is normally energized.

It will de-energize with any new alarm or shut-down. After pressing RESET the alarm relay will energize again.

5.6.1 Connection of the Siren Relay

In below example the siren will activate with any new incoming alarm or shut down.



6 Communication

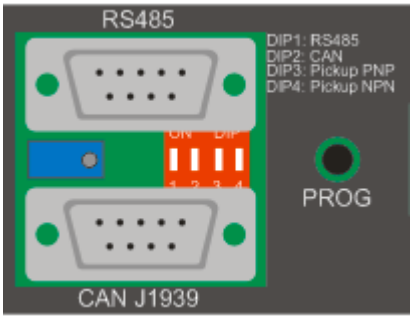
6.1 CAN J1939 Bus

The M2500 can communicate directly with the engine ECU by CAN bus, SAE J1939 for. Maximum distance 250m.

6.1.1 Connector for CAN J1939:

Pin 2:	CAN L
Pin 3:	CAN com
Pin 7:	CAN H

Termination resistors for the CAN bus are included in the M2500. They can be activated by setting DIP switch 2 ON

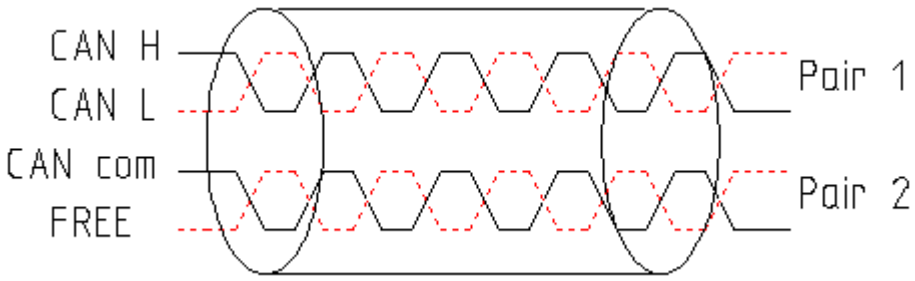


Function	DIP Setting
CAN Termination ON	DIP2 ON
CAN Termination OFF	DIP2 OFF

6.1.2 CAN cable

Unshielded twisted pair 2 x 2 x 0,22... 2 x 2 x 0,5 (e.g. Lapp Kabel UNITRONIC®, BUS CAN UL/CSA (CMX), part number 2170267).

One pair is to be used for CAN H and CAN L, one wire of the remaining pair is to be used for CAN com.



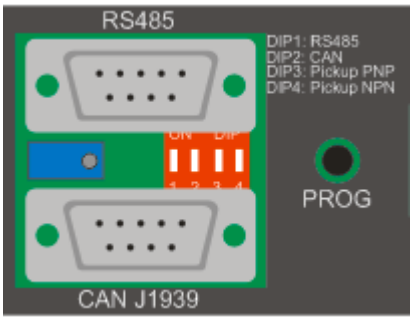
6.1.3 RS485 MODBUS

M2500 includes an RS485 interface Modbus RTU communication.

Connector for RS485:

Pin 1:	RS485 com
Pin 4:	RS485 A
Pin 8:	RS485 A
Pin 5:	RS485 B
Pin 9:	RS485 B

Termination resistors for the CAN bus are included in the M2500. They can be activated by setting DIP switch 2 ON

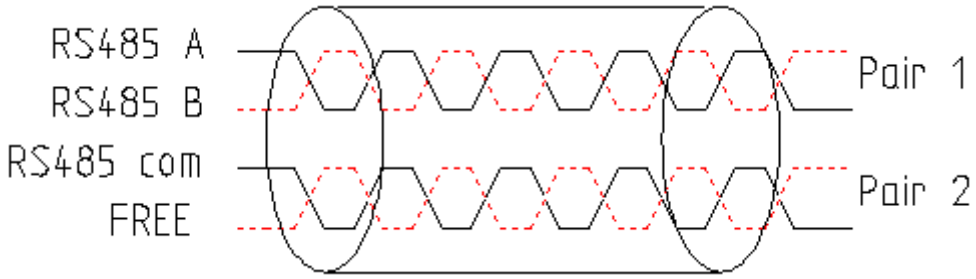


Function	DIP Setting
RS485 Termination ON	DIP1 ON
RS485 Termination OFF	DIP1 OFF

6.1.4 RS485 cable

Unshielded twisted pair 2 x 2 x 0,22... 2 x 2 x 0,5 (e.g. Lapp Kabel UNITRONIC®, BUS CAN UL/CSA (CMX), part number 2170267).

One pair is to be used for RS485 A and RS485 B, one wire of the remaining pair is to be used for CAN com.



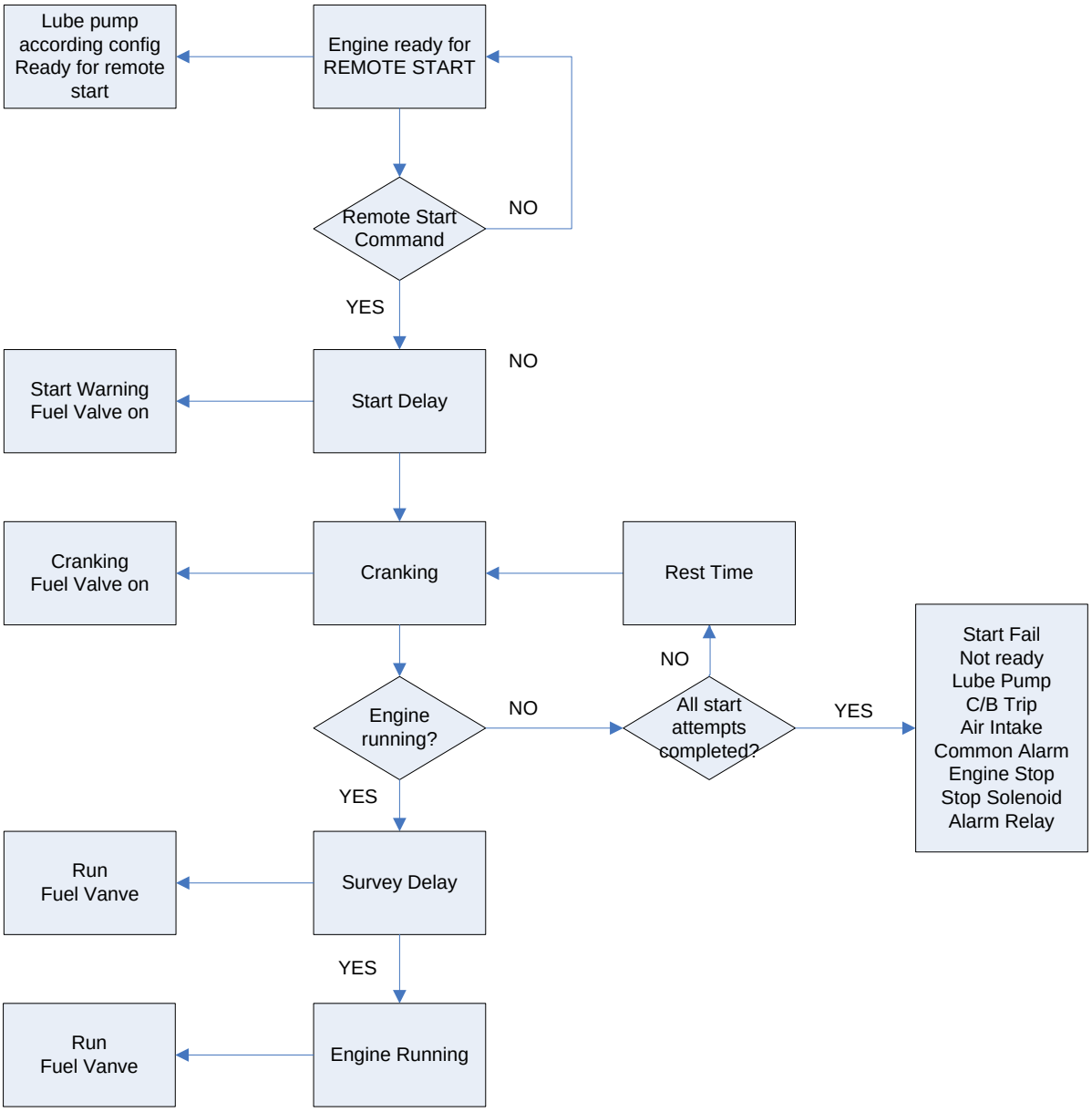
7 Functional Description

7.1 Remote Mode

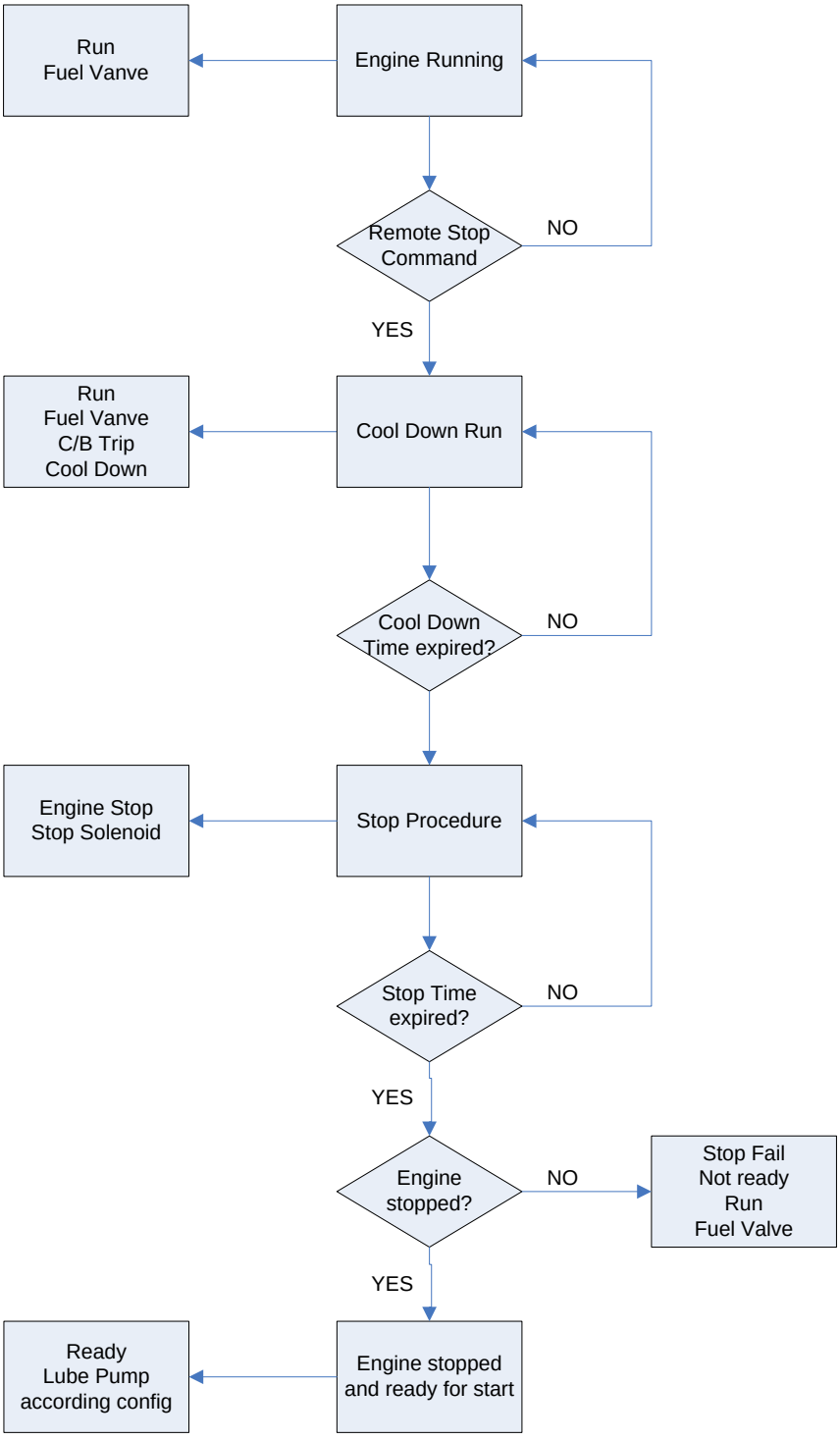
In remote mode (terminal 5 connected to com) Start and stop is only available from the REMOTE START (terminal 08) and REMOTE STOP (terminal 09) terminals.

Provided the engine is ready for remote start (Not Ready LED on the front panel of M2500 is off) the start procedure works as follows:

Remote Start flowchart:



Remote Stop flowchart:



7.2 Alarm Monitoring

The alarm monitoring is always active regardless of Local or remote mode.

Alarms are abnormal conditions that will be indicated and logged by the M2500, but they will not stop the engine.

Alarms can be set to continuous monitoring (regardless if the engine is running or not) or conditional monitoring (only monitored if the engine is running).

An individual programmable time delay is available for each alarm.

A new incoming alarm will always shift the M2500 display to the Current Alarm display. At the same time the Alarm LED on the front panel will be fast flashing, the common alarm output (terminal 46) will activate and the Siren Relay (terminals 68, 69 and 70) will de-energize. Depending on the configuration it is possible to activate one or more of the digital outputs as well.

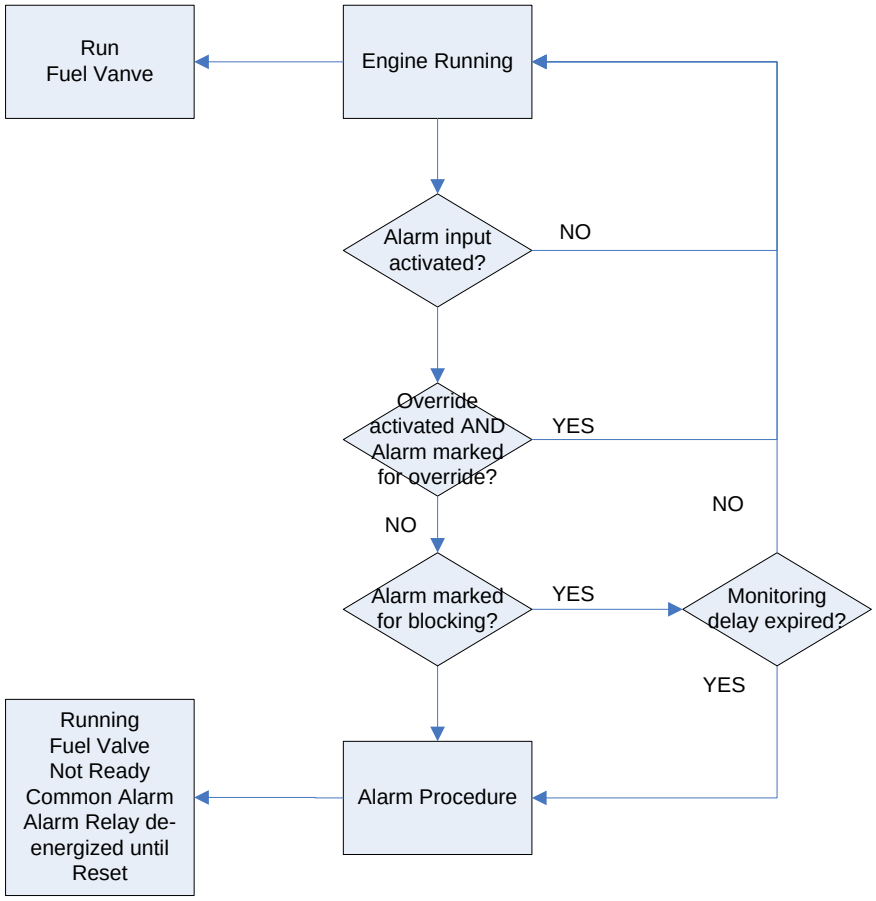
In case the common alarm output was activated already at the time the new alarm appeared, the common alarm output will de-activate for 2s and then activate again.

In case the siren relay (terminals 68, 69 and 70) was de-energized already at the time the new alarm appeared, it will energize for 2s and then de-energize again.

After accepting an alarm (by pressing the ACK button or external reset terminal 12) the common alarm LED will change to steady light, the common alarm output and the optional digital output will remain active, provided the alarm is still present on the input. The siren relay will energize again after pressing Siren Reset or ACK button or external reset terminal 12.

When the all alarms disappear from the inputs and alarms have been acknowledged, the common alarm LED will switch off, the common alarm output and the optional digital outputs will deactivate.

Alarm flowchart:



7.3 Shut Down Monitoring

The shut down monitoring is always active regardless of Local or remote mode.

Shut Downs are abnormal conditions that will be indicated and logged by the M2500 and they will stop the engine.

Shut downs can be set to continuous monitoring (regardless if the engine is running or not) or conditional monitoring (only monitored if the engine is running).

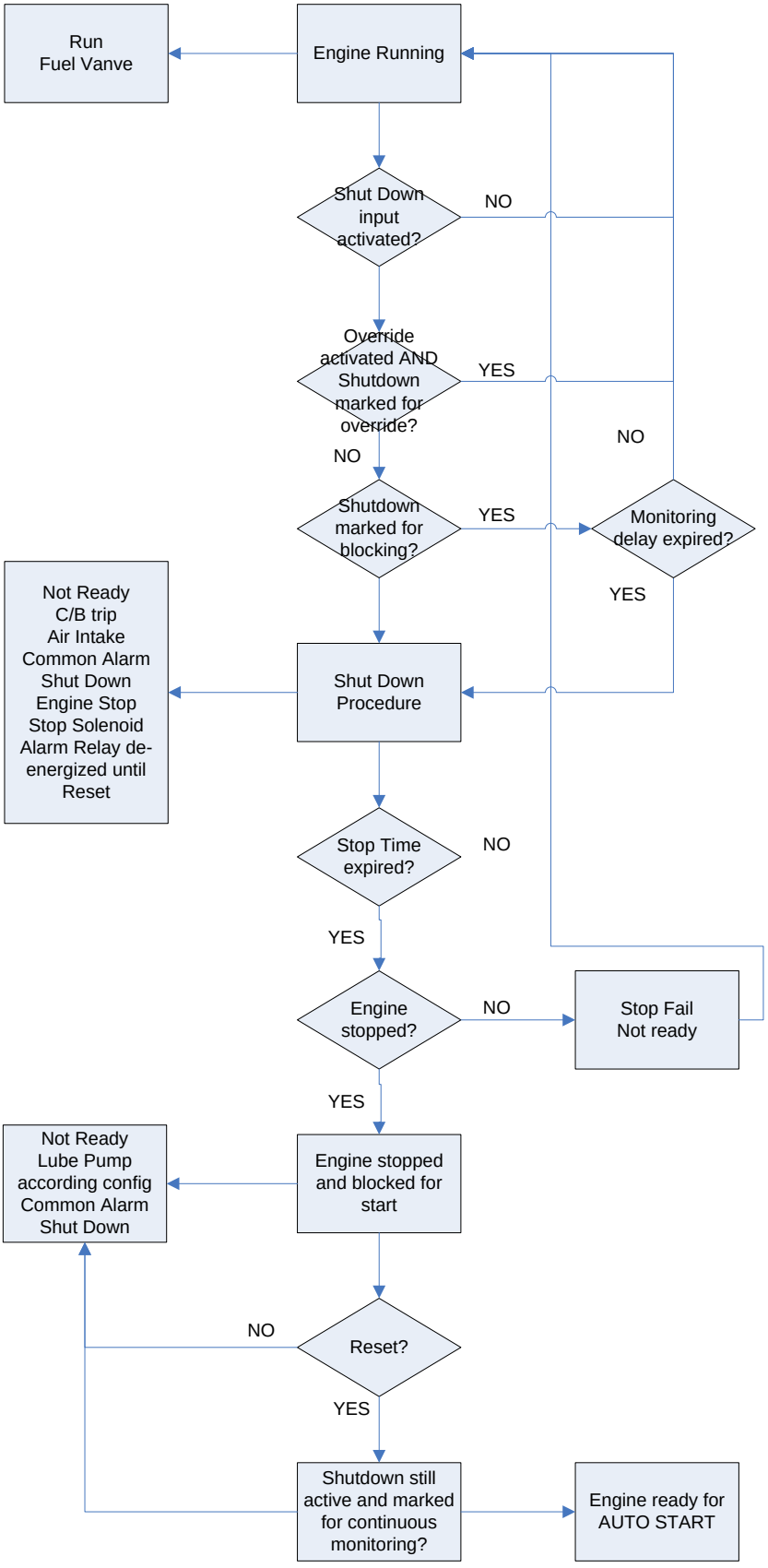
An individual programmable time delay is available for each shut down.

A new incoming shut down will always shift the M2500 display to the Current Alarm display. At the same time the shut down LED on the front panel will be fast flashing, the common shut down output (terminal 46) will activate and the Siren Relay (terminals 68, 69 and 70) will de-energize. Depending on the configuration it is possible to activate one or more of the digital outputs as well.

A shut down will block the engine for start until it has been reset and the shut down signal has disappeared.

After accepting a shut down (by pressing the ACK button or external reset terminal 12) the Common shut down LED will change to steady light. The shut down output and the optional digital output will remain active provided the shut down is still active on the input. The siren relay will energize again.

Shut down flowchart:



Specification

Environmental conditions:

Operating temperature:	-15°C to +70°C
Humidity:	95%
Vibration:	DNV vibrations class B
EMC:	IEC 60945
Enclosure:	DNV enclosure class C, IP56 (panel front only)

Supply:

Primary Supply:	+24 V DC (-30 % / +30 %) Isolated, 500mA
Backup Supply:	+24 V DC (-30 % / +30 %) Isolated, 500mA

Pick Up Input:

Connection:	Screw terminals
Type:	Magnetic (2-wire), NPN and PNP (3-wire), configurable via DIP switch.
Rated frequency	40.0 to 10000 Hz

Sensor inputs:

9 Digital inputs:	Normally open contacts to COM (default) or normally closed contacts to COM. Optional cable monitoring (short circuit and cable break).
8 Analogue inputs:	4-20mA -, with optional cable monitoring.

Mode / Control inputs:

Connection:	Screw terminals ($2{,}5mm^2$)
Activation:	Connect to COM

All relays (except where otherwise specified):

Relay response time:	20 ms (worst case)
Contact set(s)	1 normally open
Contact rating:	AC: 1 A, 250 V AC, DC: 1 A, 35 V DC
Function:	Normally de-energized.

Run/ Stop Solenoid relay:

Relay response time:	20 ms (worst case)
Contact set(s)	1 normally open
Contact rating:	AC: 8 A, 250 V AC, DC: 8 A, 35 V DC
Function:	Normally de-energized (Default) or normally energized Cable monitoring (cable break and short circuit).

System fault output relay (Siren):

Relay response time:	20 ms (worst case)
Contact set(s)	1 change over
Contact rating:	AC: 1 A, 250 V AC, DC: 1 A, 35 V DC
Function:	Normally energized.

SAE J1939, CAN Bus:

Connection:	DB9 female connector, 2-wire with COM (Isolated)
Distance:	Max. 40m
Protocol:	SAE J1939
Speed:	250Kbit/s
Termination:	Optional on-board 120 ohm termination (via DIP Switch)

USB:

Connection:	USB type B socket (Female connector), USB 2.0 Full speed Device, Mass storage device for configuration, inspection of log files and other diagnostics information.